

In the claims:

1. (original) An exercise machine comprising:
  - (a) a frame;
  - (b) a pair of laterally spaced apart foot pedals, each pedal coupled to the frame by a respective articulated linkage comprising a generally vertical first linkage pivotally coupled to the frame and a generally horizontal second linkage pivotally coupled to both the first linkage and the respective foot pedal;
  - (c) a crank assembly coupled to both of the first linkages such that the first linkages move with an alternating reciprocating action;
  - (d) motor means coupled to the articulated linkage of each foot pedal for regulating movement thereof.
2. (original) The exercise machine of claim 1 wherein the second linkage comprises a first arm and a second arm, each independently pivotally coupled to the foot pedal and the first linkage.
3. (original) The exercise machine of claim 2 wherein the first and second linkage arms are of unequal length.
4. (original) The exercise machine of claim 3 wherein the pivotal couplings of the first and second linkage arms are such that the foot pedal is progressively inclined as the foot pedal travels from an upper, forward position to a lower, rearward position.
5. (original) The exercise machine of claim 1 further comprising means for biasing the foot pedals to a starting position.

6. (original) The exercise machine of claim 5 wherein the biasing means comprises a spring.

7. (original) The exercise machine of claim 1 wherein said motor means is coupled to the crank assembly for driving the first linkages with an alternating reciprocal action.

8. (original) The exercise machine of claim 7 wherein the means for regulating movement comprises a flywheel for regulating movement of the first linkages.

9. (original) The exercise machine of claim 8 wherein the motor means is selectively coupled to the flywheel to drive the first linkages during only a portion of an exercise routine.

10. (previously amended) An exercise device, comprising:  
a frame having a base portion adapted to be supported by a floor;

first and second reciprocating members, each reciprocating member having a first end and a second end;  
a rotating member supported by said frame and defining an axis;

means for attaching said second ends of said first and second reciprocating members to said rotating member so that rotation of said rotating member results in rotation of said second ends of said first and second reciprocating members in a substantially circular path about said axis while a portion of each of said first and second reciprocating members distal said second end of each said first and second reciprocating member moves in a reciprocating pattern;

a first foot supporting linkage assembly pivotally connected to said first reciprocating member proximate said first end of said first reciprocating member; and

    a second foot supporting linkage assembly pivotally connected to said second reciprocating member proximate said first end of said second reciprocating member,

    wherein each foot of the user of the device is movable through a generally elliptical path.

11. (previously amended) The exercise device of claim 10, wherein said means comprises:

    a first element attached at one end to said rotating member proximate said axis, and at its other end to said second end of said first reciprocating member; and

    a second element attached at one end to said rotating member proximate said axis, and at its other end to said second end of said second reciprocating member.

12. (original) The exercise device of claim 10, further comprising a flywheel rotatably mounted on said frame; and a means for connecting said flywheel to said rotating member so that rotation of said rotating member causes rotation of said flywheel.

13. (previously amended) An exercising device, comprising:

    a frame having a base portion adapted to be supported by a floor;

    first and second reciprocating members, each reciprocating member having a first end and a second end;

a rotating member supported by said frame and defining an axis;

means for attaching said second ends of said first and second reciprocating members to said rotating member so that rotation of said rotating member results in rotation of said second ends of said first and second reciprocating members in a substantially circular path about said axis while a portion of each of said first and second reciprocating members distal said second end of each said first and second reciprocating member moves in a reciprocating pattern;

first and second foot supporting linkage assemblies, said first foot supporting linkage assembly pivotally connected proximate one end to said first reciprocating member proximate said first end of said first reciprocating member, said second foot supporting linkage assembly pivotally connected proximate one end to said second reciprocating member proximate said first end of said second reciprocating member, each said foot supporting linkage assembly being pivotally attached at its other end to said frame distally from said rotating member,

wherein each foot of the user is movable through a generally elliptical path.

14. (previously amended) The exercise device of claim 13, wherein said means comprises:

a first element attached at one end to said rotating member proximate said axis, and at its other end to said second end of said first reciprocating member; and

a second element attached at one end to said rotating member proximate said axis, and at its other end to said second end of said second reciprocating member.

15. (original) The exercise device of claim 13, further comprising a flywheel rotatably mounted on said frame; and a means for connecting said flywheel to said rotating member so that rotation of said rotating member causes rotation of said flywheel.

16. (previously amended) An exercise apparatus, comprising:  
a frame designed to rest upon a floor surface;  
a first crank and a second crank, wherein each said crank is mounted on the frame and rotatable relative thereto about a crank axis;  
a first rocker link and a second rocker link, wherein each said rocker link is mounted on the frame and pivotal relative thereto about a pivot axis;  
a first rigid member having a first portion movably connected to the first crank and rotatable together therewith about the crank axis, and a second portion movably connected to the first rocker link at a first distance from the pivot axis and movable in reciprocal fashion relative to the frame;  
a second rigid member having a first portion movably connected to the second crank and rotatable together therewith about the crank axis, and a second portion movably connected to the second rocker link at the first distance from the pivot axis and movable in reciprocal fashion relative to the frame;

a first foot support connected to the first rocker link at a relatively greater, second distance from the pivot axis; and

a second foot support connected to the second rocker link at the second distance from the pivot axis, wherein each said foot support is movable through a generally elliptical path.

17. (original) The exercise device of claim 16, wherein the frame supports at least one roller which carries the weight of a person standing on the apparatus.

18. (cancelled)

19. (previously amended) The exercise device of claim 16, wherein each said foot support pivots relative to a respective rocker link.

20. (original) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;

a crank mounted on the frame and rotatable about a crank axis relative to the frame;

a left foot support and a right foot support, each said foot support supported by the frame and movable through a generally elliptical path of motion relative to the frame;

at least one left link movably interconnected between the crank and the left foot support, wherein the at least one left link includes a rigid member having a first portion which rotates together with the crank about the crank axis and having a second portion which moves in a reciprocating path;

at least one right link movably interconnected between the crank and the right foot support, wherein the at least one

right link includes a rigid member having a first portion which rotates together with the crank about the crank axis and having a second portion which moves in a reciprocating path; and

    a resistance device operable to resist rotation of the crank.

21. (original) The exercise device of claim 20, wherein the frame supports at least one roller which carries the weight of a person standing on the apparatus.

22. (original) The exercise device of claim 20, wherein the right foot support is connected to the rigid member of the at least one right link, proximate the second portion thereof.

23. (original) The exercise device of claim 20, wherein the at least one right link includes a rocker link rotatably interconnected between the frame and the right foot support.

24. (original) An exercise apparatus, comprising:  
    a frame designed to rest upon a floor surface;  
    a crank mounted on the frame and rotatable about a crank axis relative to the frame;  
    a left foot support and a right foot support, each said foot support movable through a variable path of motion relative to the frame;

    at least one left link movably interconnected between the crank and the left foot support, wherein the at least one left link includes a rigid member having a first portion which rotates together with the crank about the crank axis and having a second portion which moves in a reciprocating path;

at least one right link movably interconnected between the crank and the right foot support, wherein the at least one right link includes a rigid member having a first portion which rotates together with the crank about the crank axis and having a second portion which moves in a reciprocating path; and

a resistance device operable to resist rotation of the crank.

25. (original) The exercise device of claim 24, wherein the at least one right link includes a rocker link rotatably interconnected between the frame, the right foot support.

26. (previously amended) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;

a right crank and a left crank, wherein each said crank is mounted on the frame and rotatable about a crank axis relative to the frame;

a right first link and a left first link, wherein each said first link is movably connected to the frame;

a right second link and a left second link, wherein each said second link is movably connected to a respective first link;

a right foot support and a left foot support, wherein each said foot support is connected to a respective second link and movable through multiple paths of motion relative to the frame;

a right third link movably interconnected between the right crank and one of the right first link and the right second link;

    a left third link movably interconnected between the left crank and one of the left first link and the left second link; and

    a resistance device operable to resist rotation of each said crank.

27. (previously amended) The exercise device of claim 26, wherein each said third link is movably connected to a respective first link, and rotation of each said crank causes each said first link to move in reciprocating fashion relative to the frame.

28. (previously amended) An exercise apparatus, comprising:  
    a frame designed to rest upon a floor surface; and  
    on each side of the apparatus:

        (a) a first rigid member, connected to the frame, and movable in a first direction;

        (b) a second rigid member, connected to the first rigid member, and movable relative to the first rigid member in a second, generally orthogonal direction;

        (c) a crank rotatably mounted on the frame and linked to one of the first rigid member and the second rigid member in such a manner that rotation of the crank moves said one of the first rigid member and the second rigid member in its respective direction; and

(d) a foot support connected to the other of the first rigid member and the second rigid member;

wherein a resistance device is connected to at least one said crank and operable to resist rotation of said crank.

29. (previously amended) The exercise device of claim 28, wherein on each side of the apparatus, a third rigid member is interconnected between the crank and the first rigid member, so that rotation of the crank causes the first rigid member to move in reciprocating fashion relative to the frame.

30. (previously amended) The exercise device of claim 28, wherein each said foot support is constrained to occupy a substantially constant orientation during exercise motion.

31. (new) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;

a first crank and a second crank, wherein each said crank is mounted on the frame and rotatable relative thereto about a crank axis;

a first rocker link and a second rocker link, wherein each said rocker link is mounted on the frame and pivotal relative thereto about a pivot axis;

a first rigid member having a first portion movably connected to the first crank and rotatable together therewith about the crank axis, and a second portion movably connected to the first rocker link at a first distance from the pivot axis and movable in reciprocal fashion relative to the frame;

a second rigid member having a first portion movably connected to the second crank and rotatable together therewith about the crank axis, and a second portion movably connected to the second rocker link at the first distance from the pivot axis and movable in reciprocal fashion relative to the frame; and

a first foot support and a second foot support, wherein each said foot support is connected to a respective said rocker link at a relatively greater, second distance from the pivot axis for movement through a smooth, curved path.

32. (new) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;  
a first crank and a second crank, wherein each said crank is mounted on the frame and rotatable relative thereto about a crank axis;

a first rocker link and a second rocker link, wherein each said rocker link is mounted on the frame and pivotal relative thereto about a pivot axis;

a first rigid member having a first portion movably connected to the first crank and rotatable together therewith about the crank axis, and a second portion movably connected to the first rocker link at a first distance from the pivot axis and movable in reciprocal fashion relative to the frame;

a second rigid member having a first portion movably connected to the second crank and rotatable together therewith about the crank axis, and a second portion movably connected to

the second rocker link at the first distance from the pivot axis and movable in reciprocal fashion relative to the frame; and

a first foot support and a second foot support, wherein each said foot support is connected to a respective said rocker link at a relatively greater, second distance from the pivot axis for movement through a generally ovate path.

33. (new) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;  
left and right first links mounted on the frame and pivotal relative thereto about a pivot axis;

left and right second links pivotally connected to respective said first links to define respective left and right linkage assemblies;

left and right foot supports mounted on respective said assemblies;

left and right cranks mounted on the frame and rotatable relative thereto about a crank axis, wherein said cranks are linked to respective assemblies in a manner that accommodates movement of said foot supports through respective, generally ovate paths.

34. (new) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface;  
left and right first links mounted on the frame and pivotal relative thereto about a pivot axis;

left and right second links pivotally connected to respective said first links to define respective left and right linkage assemblies;

left and right foot supports mounted on respective said assemblies;

left and right cranks mounted on the frame and rotatable relative thereto about a crank axis, wherein said cranks are linked to respective assemblies in a manner that establishes an envelope of motion for respective said foot supports.

35. (new) An exercise apparatus, comprising:

a frame designed to rest upon a floor surface; left and right first links mounted on the frame and pivotal relative thereto about a pivot axis;

left and right second links pivotally connected to respective said first links to define respective left and right linkage assemblies;

left and right foot supports mounted on respective said assemblies;

left and right cranks mounted on the frame and rotatable relative thereto about a crank axis, wherein said cranks are linked to respective assemblies in a manner that dictates movement of said foot supports in a first direction while accommodating user determined movement of said foot supports in a generally perpendicular, second direction.

36. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame having a base portion adapted to be supported by a floor;

providing first and second reciprocating members, each reciprocating member having a first end and a second end;

mounting a rotating member on said frame for rotation about an axis;

attaching said second ends of said first and second reciprocating members to said rotating member so that rotation of said rotating member results in rotation of said second ends of said first and second reciprocating members in a circular path about said axis while a portion of each of said first and second reciprocating members distal said second end of each said first and second reciprocating member moves in a reciprocating pattern;

pivottally connecting a first foot supporting linkage assembly to said first reciprocating member proximate said first end of said first reciprocating member; and

pivottally connecting a second foot supporting linkage assembly to said second reciprocating member proximate said first end of said second reciprocating member, wherein each foot of the user of the device is movable through a generally ovate path.

37. (new) The method of claim 36, wherein a first element is attached at one end to said rotating member proximate said axis, and at its other end to said second end of said first reciprocating member; and a second element is attached at one end

to said rotating member proximate said axis, and at its other end to said second end of said second reciprocating member.

38. (new) The method of claim 36, further comprising the steps of rotatably mounting a flywheel on said frame; and connecting said flywheel to said rotating member so that rotation of said rotating member causes rotation of said flywheel.

39. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame having a base portion adapted to be supported by a floor;

mounting first and second reciprocating members on said frame for reciprocating movement relative to said frame;

mounting a rotating member on said frame for rotation about an axis;

attaching one end of each of said first and second reciprocating members to said rotating member so that each said one end rotates about said axis while a discrete portion of each of said first and second reciprocating members moves in a reciprocating pattern; and

pivottally connecting first and second foot supporting assemblies to respective said reciprocating members proximate an opposite end of each of said first and second reciprocating members in a manner that accommodates movement of a user's feet through a generally ovate path.

40. (new) The method of claim 39, wherein said means comprises a first element attached at one end to said rotating

member proximate said axis, and at its other end to said one end of said first reciprocating member; and a second element attached at one end to said rotating member proximate said axis, and at its other end to said one end of said second reciprocating member.

41. (new) The exercise device of claim 39, further comprising a flywheel rotatably mounted on said frame; and a means for connecting said flywheel to said rotating member.

42. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame designed to rest upon a floor surface;

mounting a first crank and a second crank on said frame for rotation about a crank axis;

mounting a first rocker link and a second rocker link on said frame for pivoting about a pivot axis;

providing a first rigid member with a first portion movably connected to said first crank and rotatable together therewith about said crank axis, and with a second portion movably connected to said first rocker link at a first distance from said pivot axis and movable in reciprocal fashion relative to said frame;

providing a second rigid member with a first portion movably connected to said second crank and rotatable together therewith about said crank axis, and a second portion movably connected to said second rocker link at said first distance from

said pivot axis and movable in reciprocal fashion relative to said frame;

connecting a first foot support to said first rocker link at a relatively greater, second distance from said pivot axis; and

connecting a second foot support to said second rocker link at said second distance from said pivot axis, wherein each said foot support is movable through a generally ovate path.

43. (new) The method of claim 42, further comprising the step of providing a frame supported roller to carry the weight of a person exercising on the machine.

44. (new) The method of claim 42, wherein each said connecting step involves pivotally connecting a respective said foot support to a respective said rocker link.

45. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame designed to rest upon a floor surface;

mounting a crank on said frame for rotation about a crank axis;

providing a left foot support and a right foot support; movably interconnecting at least one left link between said crank and said left foot support to accommodate movement of said left foot support through a generally ovate path relative to said frame, wherein said at least one left link includes a rigid member having a first portion that rotates together with said

crank about said crank axis and having a second portion that moves in a reciprocating path;

movably interconnecting at least one right link between said crank and said right foot support to accommodate movement of said right foot support through a generally ovate path relative to said frame, wherein said at least one right link includes a rigid member having a first portion that rotates together with said crank about said crank axis and having a second portion that moves in a reciprocating path; and

connecting a resistance device to said crank to resist rotation of said crank.

46. (new) The method of claim 45, further comprising the step of providing a frame supported roller to carry the weight of a person exercising on the machine.

47. (new) The method of claim 45, wherein each said interconnecting step involves connecting a respective said foot support to a respective said rigid member proximate a respective said second portion thereof.

48. (new) The method of claim 45, further comprising the steps of interconnecting a left rocker link between said frame and a respective said rigid member.

49. (new) A method of providing an exercise apparatus, comprising the steps of:

providing a frame designed to rest upon a floor surface;

mounting a crank on the frame for rotation about a crank axis;

providing a left foot support and a right foot support; movably interconnecting at least one left link between said crank and said left foot support to accommodate movement of said left foot support through a variable path of motion relative to said frame, wherein said at least one left link includes a rigid member having a first portion that rotates together with said crank about said crank axis and having a second portion that moves in a reciprocating path;

movably interconnecting at least one right link between said crank and said right foot support to accommodate movement of said right foot support through a variable path of motion relative to said frame, wherein said at least one right link includes a rigid member having a first portion that rotates together with said crank about said crank axis and having a second portion that moves in a reciprocating path; and

connecting a resistance device to said crank to resist rotation of said crank.

50. (new) The method of claim 49, further comprising the steps of rotatably interconnecting a left rocker link between said frame and said left foot support, and rotatably interconnecting a right rocker link between said frame and said right foot support.

51. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame designed to rest upon a floor surface;

mounting a right crank and a left crank on said frame for rotation about a crank axis;

movably connecting a right first link and a left first link to said frame;

movably connecting a right second link and a left second link to a respective said first link;

connecting a right foot support and a left foot support to a respective said second link for movement through multiple paths of motion relative to said frame;

movably interconnecting a right third link between said right crank and one of said right first link and said right second link;

movably interconnecting a left third link between said left crank and one of said left first link and said left second link; and

connecting a resistance device to at least one said crank to resist rotation thereof.

52. (new) The method of claim 51, wherein each said interconnecting step involves movably connecting a respective said third link to a respective said first link to link rotation of each said crank to reciprocal movement of each said first link relative to said frame.

53. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame designed to rest upon a floor surface; and

on each side of the machine:

(a) connecting a first rigid member to said frame for movement in a first direction relative to said frame;

(b) connecting a second rigid member to said first rigid member for movement relative to said first rigid member in a second, generally orthogonal direction;

(c) mounting a crank on said frame;

(d) linking said crank to one of said first rigid member and said second rigid member in such a manner that rotation of said crank moves said one of said first rigid member and said second rigid member in its respective direction;

(e) connecting a foot support to the other of said first rigid member and said second rigid member; and

(f) connecting a resistance device to at least one said crank to resist rotation of said crank.

54. (new) The method of claim 53, wherein said linking step involves interconnecting a respective third rigid member between said crank and a respective said first rigid member so that rotation of each said crank causes a respective said first rigid member to move in reciprocating fashion relative to said frame.

55. (new) The method of claim 53, further comprising the step of constraining each said foot support to occupy a substantially constant orientation during exercise.

56. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame configured to rest on a floor surface;

pivottally mounting left and right first links on said frame;

movably connecting left and right second links to respective said first links to define respective left and right linkage assemblies;

mounting left and right foot supports on respective said assemblies;

rotatably mounting left and right cranks on said frame; and

linking said cranks to respective said assemblies in a manner that dictates movement of said foot supports in a first direction while accommodating user determined movement of said supports in a generally perpendicular, second direction.

57. (new) The method of claim 56, wherein said connecting step involves pivottally connecting said second links to respective said first links.

58. (new) The method of claim 56, further comprising the step of selectively constraining said foot supports to move only in said first direction.

59. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame configured to rest on a floor surface;

pivottally mounting left and right first links on said frame;

movably connecting left and right second links to respective said first links to define respective left and right linkage assemblies;

mounting left and right foot supports on respective said assemblies;

rotatably mounting left and right cranks on said frame; and

linking said cranks to respective assemblies in a manner that establishes an envelope of motion for respective said foot supports.

60. (new) The method of claim 59, wherein said connecting step involves pivottally connecting said second links to respective said first links.

61. (new) The method of claim 59, further comprising the step of selectively constraining the assemblies to move along a single path within the envelope of motion.

62. (new) A method of providing an exercise machine, comprising the steps of:

providing a frame configured to rest on a floor surface;

pivotally mounting left and right first links on said frame;

movably connecting left and right second links to respective said first links to define respective left and right linkage assemblies;

mounting left and right foot supports on respective said assemblies;

rotatably mounting left and right cranks on said frame, and

linking said cranks to respective assemblies in a manner that accommodates movement of said foot supports through respective ovate paths.

63. (new) The method of claim 62, wherein said connecting step involves pivotally connecting said second links to respective said first links.

64. (new) The method of claim 62, further comprising the step of selectively constraining said foot supports to move along respective reciprocal paths.